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OBSERVER HANDBOOK
AUTOMATED WEATHER OBSERVING SYSTEM (AWOS)
(INTERIM)

1. INTRODUCTION:

1.1 General. This Handbook prescribes the interim instructions necessary for a certified weather observer to operate the Automated Weather Observing System (AWOS) manufactured by Qualimetrics, Inc. under contract with the Federal Aviation Administration (FAA). Final instructions and standardized procedures applicable to the automated observing systems of all Federal agencies will be published by the Office of the Federal Coordinator for Meteorological Services and Supporting Research as a change to the Federal Meteorological Handbook No. 1 (FMH-1), Surface Observations.

Principal approval is required for use of the AWOS as a weather source for specific air carrier flight operations. Information concerning POI approval may be obtained from the FAA Flight Standards District Office.

The airport manager (or designated representative) is authsrized limited use of the AWOS for the inclusion of airport Notice to Airmen (NOTAM) information. This use is limited to appending an airport NOTAM to the AWOS voice broadcast. The procedures applicable to these NOTAMs are incorporated into this Handbook.

The Handbook is divided into six mayor paragraphs. This first paragraph introduces the Handbook, provides guidance on the certification of weather observers, briefly describes the four AWOS operational modes, and specifies manual backup requirements. Paragraph 2 describes the observations and details the operation of the AWOS in each of the four operational modes. Paragraph 3 contains guidance relevant to determining the mode of operation of the AWOS and the recording of observations. Paragraphs 4 and 5 contain information concerning archiving and maintenance. Paragraph 6 prescribes the system operating procedures. The figures applicable to the instructions in paragraph 6 have been consolidated in Appendix A.

CAUTION: THE SYSTEM CONTAINS SOME OPERATOR FUNCTIONS THAT ARE NOT EXPLAINED IN THIS HANDBOOK, AND WHICH ARE NOT TO BE USED BY THE WEATHER OBSERVER OR AIRPORT MANAGER. THE USE OF THESE FUNCTIONS WILL NOT BE ACCEPTED BY THE COMMUNICATIONS SYSTEM, AND COULD INVALIDATE THE OBSERVATION. ONLY THE SPECIFIC OPERATOR

FUNCTIONS DESCRIBED IN THIS HANDBOOK ARE TO BE USED BY THE WEATHER OBSERVER AND AIRPORT MANAGER.

1.2 Certification of Weather Observers. To manually augment or back up the AWOS observations, the weather observer on duty must be approved/certified by the National Weather Service (NWS).

1.3 Operational Modes. The AWOS is to be operated in one of the following modes: Mode 1, Full-time Automated Operation: Mode 2, Full-time Automated Operation with Airport NOTAMs; Mode 3, Full-time Automated Operation with Manual Weather Augmentation and Airport NOTAM Option: and Mode 4, Part-time Manual Operation. No manual interface with the system is required for operation in Mode 1. The AWOS must be configured with an Operator Terminal (OT) to be operated in Modes 2, 3, and 4. A weather observer must be on duty during prescribed and published hours for manual augmentation (Mode 3) or manual operation (Mode 4). Also, manual operation in Mode 4 is normally used routinely only at locations designated by the FAA. Other locations normally use Mode 4 for backup purposes, or for the dissemination of urgent special reports (USPs). The airport manager (or designated representative) must be available during any period that NOTAMs are appended to the AWOS voice broadcast.

1.4 Manual Backup. Manual backup is applicable only at airports that have an agreement with the NWS to maintain a manual observing capability as backup in the event of an AWOS outage, and at locations where the FAA is responsible for the weather observations. The procedures in Federal Meteorological Handbook No. 1 (FMH-1) or, as applicable, Federal Meteorological Handbook No. 9 (FMH-9) apply to manual backup observations. For the purposes of backup, an AWOS outage is defined as the failure of any critical parameter. A parameter is considered to have failed if the output is missing, garbled or unquestionably erroneous. The critical parameters are: ceiling/sky condition, visibility, wind direction/speed and altimeter setting. All backup instruments used for altimeter setting sources must meet the calibration, technical, and operational requirements specified in FAA Advisory Circular 91-14D and FMH-1 or, as applicable, E"-9. Otherwise, the altimeter setting shall be reported as missing. Backup of the other critical parameters (ceiling/sky condition, visibility, wind direction and speed) should, to the extent possible, be accomplished by non-AWOS instruments/equipment maintained in accordance with the agreement with the NWS or, in the case of locations staffed by the FAA, in accordance with FAA procedures. If instruments and equipment to measure these parameters are not available, the parameters may be estimated by an observer using the procedures in FMH-1 (or -9).

1.4.1 Manual Backup Procedures. The situations requiring manual backup range from the failure of a single sensor (e.g., laser ceilometer), to a total system outage resulting in the loss of all data processing and communications (voice and data) capabilities. All outages/failures are to be reported to Qualimetrics, Inc. in accordance with paragraph 5.2, below. The specific backup procedures that can be implemented depend upon whether or not the system is configured with an OT and, if so, whether or not the system data processing and communication capabilities are lost.

(a) If the system is not configured with an OT, locally developed, site-specific backup procedures are required for recording and disseminating the manual backup observations. These local backup procedures must be such that they can be implemented independent of the AWOS, i.e., stand-alone procedures. Further, these procedures must be tailored to meet dissemination requirements as follows:

(1) If the NWS does not issue a terminal forecast (FT) for the airport, dissemination of the backup observations over Service A is not required. In this situation, manual backup observations may be taken and disseminated solely in support of local airport operations. Depending upon the extent of the outage, the backup observations may range from the manual observation of a single parameter (e.g. sky condition/ceiling) to a complete manual observation. For example, if the ceilometer fails resulting in "missing" sky condition/ceiling information, a backup manual observation of the sky condition/ceiling may be disseminated via airline communications facilities as backup for the "missing" AWOS ceiling/sky condition information. Concurrent with the implementation of this backup procedure, Qualimetrics must be contacted (916-928-0720) to: (1) report the outage causing the manual backup procedure to be implemented, (2) request that the failed sensor(s) be set out of service, and (3) if the AWOS observations are normally disseminated over Service A, request that they place the system in "test" status. Setting the failed sensor(s) out of service is an important step and necessary to preclude the possibility of erroneous data being disseminated over the telephone and ground-air voice outlets. When a failed sensor(s) is set out of service, the applicable parameter(s) is voiced as "missing" over the AWOS telephone and voice outlets. Placing the system in "test" status, if required, prevents the transmission of the automated observations over the Service A network, which eliminates any possible conflict with the manual backup observations being disseminated locally. While the system is in "test" status, the word "TEST" is included in the voice (radio and telephone) transmissions.

(2) If the NWS does issue a terminal forecast (FT) for the airport, dissemination of complete manual backup observations over Service A is required. In this situation, complete manual backup observations may be relayed to a location with access to the Service A communications system for dissemination over Service A. For example, airport personnel could phone in a complete manual backup observation to an FAA Flight Service Station for dissemination over Service A. Actions to be taken with Qualimetrics are the same as in paragraph (1), above, (i. e., report the outage, set the failed sensor(s) out of service, and set system in "test" status) except that setting the system in "test" status will always be necessary. This is because all AWOS observations from airports for which the NWS issues an FT are disseminated over Service A. Setting the system in "test" status prevents the transmission of the automated observations over the Service A network, which eliminates any possible conflict with the manual backup observations being disseminated over Service A.

(b) If the system is configured with an OT, and if the system data processing and communications capabilities are lost, locally developed, site-specific backup procedures in accordance with paragraph (a), above, are required.

(c) If the system is configured with an OT, and if the system data processing and communications capabilities are not lost, backup is implemented by switching the system to manual mode operation (paragraph 6.6, below).

(d) In the event of an AWOS outage at locations where the FAA is responsible for taking the weather observations, and the outage is such that the OT cannot be used, existing communication facilities are to be used for distribution of the manual observations to the Weather Message Switching Center (WMSC).

1.5 Changes. This Handbook is published by the FAA AWOS Program Office (ANW-140). User comments and suggested changes should be forwarded to the AWOS Program Office (ANW-140), Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, D.C. 20591. The Handbook is designed for interim use only, and is to be replaced by a change to FMH-1.

2. DESCRIPTION OF AWOS OPERATIONAL MODES;

2.1 Mode 1, Full-time Automated Operation. In this mode, the AWOS operates 24 hours/day without any manual input. The automated weather observations produced are updated on a minute-by-minute basis. There is no weather observer input to the AWOS. However, a manual observing capability may be maintained as

backup provided that an agreement with the NWS to maintain a manual observing capability exists.

2.1.1 Automated Weather Observations. The systems are configured as AWOS-IIIs. The observations consist of automated reports of ceiling/sky condition, visibility, temperature, dew point, wind direction/speed/gusts, altimeter setting, and, if certain conditions are met, automated remarks containing density altitude and variable visibility and wind direction. A precipitation accumulation sensor is included, but the data collected are used only as an input to the visibility algorithm and coded for longline transmission for use by forecasters. Automated observations are broadcast on a ground-air radio and made available on a telephone answering device. Selected sites also have a data output port for the transmission of selected observations to the Weather Message Switching Center (WMSC) for introduction into the Service A teletype network.

2.1.1.1 Description of Automated Weather Observation Parameters. Algorithms are used to derive the automated parameters from raw sensor inputs. A brief description of the algorithms follows:

2.1.1.1.1 Ceiling/Sky Condition. Ceiling and sky condition are determined from sensor outputs every 30 seconds and integrated over a 30-minute sample period. Integration of the data over a 30-minute period allows the use of a single sensor to estimate the sky condition. A weighting scheme is employed that gives double weight to data collected during the last 10 minutes of the 30-minute sample period. This makes the algorithm more responsive to rapid changes in ceiling/sky condition. Heights up to 12,000 feet are reported in hundreds of feet (e.g., 30 represents a height of 3,000 feet). No clouds detected is currently voiced as "No Clouds Below 12000". However, this will be changed in the near future to "Clear Below 12000". The contraction used for the Service A transmission is "CLR BLO 120". The AWOS ceiling and sky condition are considered to be representative of conditions in the vicinity of the sensor site. They can be significantly different from those reported by human observers evaluating these parameters using the "entire sky" concept, and often observed from a remote vantage point. The sensor is normally installed near the touchdown area of the primary instrument runway so that the reported conditions are representative of the touchdown area.

2.1.1.1.2 Visibility. Visibility is determined from sensor outputs at 10-second intervals that are used to compute a one-minute average extinction coefficient. A correction factor is applied based upon an input from the precipitation accumulation sensor. The one-minute corrected extinction coefficient is

converted into a one-minute visibility value through either a day or night visibility equation. These one-minute visibility values are harmonically averaged over a 10-minute period to determine the reported visibility. Reportable values are: less than 1/4 (<1/4), 1/4, 1/2, 3/4, 1, 1 1/4, 1 1/2, 1 3/4, 2, 2 1/2, 3, 3 1/2 4, 5, 7, and 10 miles. T co s'dered o be representative of the visibility in the aenera1 vicinitv of the airport runway complex. It can be significantly different from the visibility reported by human observers using the "prevailing visibility" concept, and often observed from a remote vantage point.

2.1.1.1.3 Temperature. Temperature is a 5-minute average temperature calculated each minute from sensor readings taken at least once each minute.

2.1.1.1.4 Dew Point. Dew point is a 5-minute average dew point temperature calculated each minute from sensor readings taken at least once each minute. The lowest dew point reported is -32°F.

2.1.1.1.5 Wind SDeed and Direction. Wind speed and wind direction are 2-minute running averages calculated from sensor reading taken at one-second intervals.

2.1.1.1.6 Wind Gust. Wind gust is determined from the highest 5-second average wind speed for the past 10 minutes.

2.1.1.1.7 Altimeter Setting. The AWOS includes two pressure sensors. Readings from the two sensors are compared continuously in order to detect sensor failure or degradation. A one-minute average pressure is calculated for each sensor from readings taken at least every 10-seconds. Altimeter setting is computed from the lowest one-minute average of the *two* sensors.

2.1.1.1.8 Automated Remarks.

(a) Density Altitude. Density altitude is computed from the same pressure used to compute the altimeter setting, i.e., the lowest one-minute average of the two pressure sensors. Density altitude is only reported when it is more than 1000 feet above field elevation. Density altitude is reported only on the voice broadcast, i.e., it is not included on the Service A longline transmission.

(b) Variable Visibility. Variable visibility is reported when the visibility (10-minute harmonic average) is less than 3 miles and the individual one-minute visibility values vary by one or more reportable values during a 10-minute period.

(c) Variable Wind Direction. Variable wind direction is reported when the wind direction varies around the reported wind direction (2-minute average) by 60 degrees or more when the wind speed is 7 knots or greater.

2.2 Mode 2. Full-time Automated Operation with Airport NOTAMs. Operation in this mode is the same as full-time automated operation (paragraph 2.1, above) with the addition of the capability to append a manually recorded NOTAM to the automated voice reports. The airport manager is responsible for the NOTAM information. This responsibility includes updating it as required to insure that the information is current. The NOTAM information only goes on the local voice broadcast, and is not transmitted longline. This local broadcast does not replace the routine procedures for the posting of NOTAMs nor any distribution required over the National Communications System. There is no weather observer input.

2.3 Mode 3, Full-time Automated Operation with Manual Weather Augmentation and Airport NOTAM Option. Operation in this mode provides the capability for a weather observer to manually augment the automated observation by appending a weather entry to the observation during the weather observer duty hours. [Note: Procedures are being established whereby the observer duty hours are to be published in the Airport/Facility Directory (A/F D)]. The addition of an airport NOTAM per paragraph 2.2, above, is also permitted in this mode of operation provided there is no interference with the observer augmentation. Manual augmentation by the observer has priority over the addition of airport NOTAM information. The maximum length of the appended voice message (observer entry plus NOTAM) is 30 seconds. The weather observer is responsible for the accuracy and timeliness of the added weather information. The weather added by the observer is to be manually recorded and appended to the automated voice reports using the OT microphone, and entered manually into the system for transmission to the WMSC for introduction into the Service A teletype network via the OT keyboard. The maximum lenath of the message enfered into the system for transmission to the WMSC is 80 characfers. including spaces. The weather to be added is listed below. The procedures in Federal Meteorological Handbook No. 1 (FMH-1) or, as applicable, Federal Meteorological Handbook No. 9 (FMH-9), apply to these entries, except the entries are to be included in the "remarks" portion of the observation.

(a) Thunderstorms occurring at the point of observation, i.e., (1) thunder is heard, or (2) overhead lightning or hail is observed, and the local noise level is such as might prevent hearing thunder at the point of observation.

(b) Precipitation (all forms, type and intensity) occurring at the point of observation.

(c) Obstructions to vision (alone or in combination with precipitation) at the point of observation when the AWOS visibility is 3 miles or less.

(d) Convective clouds (CB, CBMAM) within a five mile radius of the airport.

(e) Operationally significant, localized weather conditions (those not reported under (a)-(d), above, but that are operationally significant for airport operations) as follows:

- Blowing Sand
- Blowing Dust
- Blowing Snow
- Dense Smoke
- Patchy Fog or Fog Bank
- Heavy Precipitation (other than (b), above)
- Virga
- Tornadoes"'
- Waterspouts"'
- Funnel clouds"'
- volcanic eruptions"'

Note:

Only those episodes of weather phenomena listed under paragraph (e), above, that are occurring within a five mile radius of the airport, and that pose an operational hazard for aircraft in the airport area should be reported. Weather phenomena marked with a (1) will be reported as urgent specials (USPs) using Mode 4 described in paragraph 2.4, below.

2.4 Mode 4. Part-time Manual Operation. Operation in this mode is normally used routinely only at locations designated by the FAA. Other locations normally use this mode for the dissemination of urgent specials (USPs) and for backup (paragraph

1.4.1, above). operation in this mode permits a weather observer to enter a complete manual observation into the system. The procedures in FMH-1 (or -9) apply to the recording and formatting of these manual observations. Once the manual observation is entered into the system, the transmission of the observation to the WMSC is automatic. However, voice dissemination of the observations must be done manually using the OT microphone. The manual observations include input from the automated AWOS outputs available to the weather observer on the OT display, to be modified to FMH-1 (or -9) requirements. For example, the manual observation includes manually derived ceiling/sky condition and visibility using FMH-1 (or -9) definitions, which differ somewhat from the AWOS algorithms. Temperature, dew point, wind direction/speed and altimeter setting are the same and should be used exactly as presented on the AWOS OT display. Sea level pressure, if required to be included in the observation, must be computed manually since it is not an output included in the AWOS automated output. Locations using Mode 4 during observer duty hours are to operate the system in Mode 1, Full-time Automated Operation, outside of the observer duty hours. Other locations using Mode 4 for backup or for the dissemination of urgent specials (USPs) are to return to their normal mode operation when backup or the dissemination of USPs is no longer required.

3. OBSERVING PRACTICES:

modes specified in paragraph 2, above. At any given time, there must be only one official weather observation for an airport. The AWOS observations, when the AWOS is in an operational status and disseminating Observations, will normally be the official observations for the airport. Observations other than the AWOS observations (e.g., manual observations taken by certified weather observers) may be the official observations for the airport .provided: (1) the dissemination of the AWOS observations is terminated, or (2) if the AWOS observations are being disseminated, they are clearly flagged as being "test" or "unofficial"."

(b) The AWOS is operated in Mode 2, Full-Time Automated Operation with Airport NOTAMs, when the airport manager (or designated representative) is available to take responsibility for the currency of NOTAM information. A weather observer is not on duty.

(c) The AWOS is operated in Mode 3, Full-Time Automated Operation with Manual Weather Augmentation and Airport *NOTAM* Option, on a published schedule. (Note: Procedures are being established whereby the weather observer agumentation hours are to be published in the A/F D).

(d) The AWOS is operated in Mode 4, Part-Time Manual Operation, during published observer duty hours. (Note: Procedures are being established whereby the observer duty hours are to be published in the A/F D). Other locations normally operate in this mode for backup and for the dissemination of USPs.

3.3 Changes to the Mode of Operation. Routine changes to the mode of operation--including any observer duty hour changes applicable to Modes 3 and 4--are to be coordinated in advance. (Note: Procedures are being established for coordinating observer duty hour changes with a designated FAA office.) Emergency-type changes brought about by unforeseen circumstances are to be coordinated with the designated FAA office as soon as possible.

3.4 Recording of Observations. Manual weather augmentation entries (Mode 3) and complete manual weather observations (Mode 4) are to be recorded on Meteorological Form (MF) 1-10 or, as applicable, MF 1-10C. The instructions in FMH-1 (or -9) apply to the recording of complete manual observations (Mode 4). Back up manual observations of specific parameters(s) taken in accordance with paragraph 1.4.1(a)(1), above, are to be recorded in the appropriate column(s) of MF 1-10 or, as applicable, MF 1-10C. Manual weather augmentation entries (Mode 3) are to be recorded on MF 1-10 (or 1-10C) using Column 2 (Time), Column 13 (Remarks), and Column 15 (Observer Initials). There is no requirement to record observations during operation in Modes 1 and 2.

4. ARCHIVING: All automated observations are stored in the system memory at 20-minute intervals for a period of four days. In the event of an aircraft mishap, a 24-hour segment of these observations covering the reported time of the mishap is to be "locked" into the system memory for later recovery. The disposition of MF 1-10 (or -10C) forms used in Modes 3 and 4 is to be in accordance with FMH-1 (or -9).

5. MAINTENANCE AND OUTAGE REPORTING:

5.1 Maintenance. Qualimetrics, Inc. is responsible for all maintenance on the AWOS. This maintenance includes monthly inspections, quarterly operational checks, annual revalidations, and all required repairs.

5.2 Outage Reporting. All AWOS equipment failures or problems are to be reported to the Qualimetrics, Inc. telephone answering service. This service operates 24 hours a day, 7 days a week. The telephone number is (916)-928-0720.

6. SYSTEM OPERATING PROCEDURES:

6.1 Controls and Indicators. The OT includes a video display, keyboard, printer and microphone. Controls and indicators for the video display and keyboard are described in Figure 6.1 and Table 6.1; and for the printer in Figure 6.2 and Table 6.2.

6.2 Passwords. All operator interaction with the system is password controlled. The distribution of passwords is controlled by the site manager. The password consists of four characters (two characters plus two operator initials).

6.3 Mode 1, Full-time Automated Operation. Procedures. There is no manual interface with the system in this operational mode.

6.3.1 System Start-up. Apply power. After power has been applied to the system, either initially or after a power down for maintenance, the system will enter an automatic start-up sequence. During the automatic start-up sequence, which takes several seconds, the system will perform its self-test. The system operating parameters will be loaded, RAM will be initialized and tested, data tables will be cleared, and various components will be tested. If power is subsequently interrupted, the system will automatically initialize itself. When the system is operating properly, the following messages will appear on the video display at power up:

"SYSTEM PERFORMING SELF-TESTS"
"SELF-TEST OK"

Within five seconds of power on, the video screen will be cleared, and the parameter headers will appear on the screen. At the next second which is a multiple of five, the date and time will appear on the screen, and the voice message will begin. Initially, all parameters will be displayed as "missing", and the voice will produce an "AWOS Temporarily Inoperative" message. Figure 6.3 shows a typical screen display of the measured weather parameters. The system operational mode is displayed below the

TABLE 6.1

VIDEO DISPLAY CONTROLS AND INDICATORS

Control/Indicator	Function
ON/OFF SWITCH	Power input switch
CONTRAST ADJUSTMENT	Adjusts screen brightness
KEYBOARD	Input system commands

TABLE 6.2

DIGITAL PRINTER

Control/Indicator	Function
POWER ON/OFF	power input switch
PLATEN KNOB	Manual paper feed
LINE FEED	Feeds paper up one line
FORM FEED	Feeds paper up one page
PARK SWITCH	Sends form paper to park position
TOP SWITCH	sets top of form
PRINT QUALITY SWITCH	Set for utility (UTL) printing
CHARACTER PITCH	set to 10 characters/inch
SELECT SWITCH	On-line when select light illuminates
MODE SWITCH	Selects print or setup mode

"AIRPORT IDENTIFICATION". "AUTOMATIC MODE" is displayed when the system is being operated in Modes 1, 2 or 3. "MANUAL MODE" is displayed when the system is being operated in Mode 4. In addition, "TEST MODE" is displayed when the system is in "test" status. The "STATUS" code displayed in the lower left corner of the screen is used by maintenance personnel to troubleshoot the system. After a period of time, each weather parameter will become active. The algorithm processing is such that the time required for the initialization of the weather parameters varies from one minute (altimeter setting) to approximately 22 minutes (ceiling/sky condition).

6.3.2 System Self-Checks. System RAM and EPROM are tested on a continuous basis in a cyclic manner. During a periodic interrupt, which occurs 100 times per second, one block of RAM and one of EPROM is tested. In a period of under sixteen and one-half minutes, all system memory is tested. A "watchdog" system monitors operation and checks reference voltages.

6.4 Mode 2, Full-time Automated Operation with Airport NOTAMs Procedures. The procedures applicable to this mode of operation are the same as those for Mode 1, except for those necessary for the operator to append an airport NOTAM to the automated voice message. The maximum length of the NOTAM message is 30 seconds.

6.4.1 Operator/System Interaction. Operator (i.e., airport manager or designated representative) interaction with the system is via the OT keyboard. The OT has three basic operation menus. They are: Operator, Maintenance, and Archive. The Operator menu allows interactive system control while continuing to display the measured weather parameters. Use of either the Maintenance or Archive menu will clear the measured weather parameters from the screen while in that menu, While operating within a menu, and unless keystrokes are made within 45 seconds, a keyboard timeout feature will return the screen to the previous screen displayed. Use of the "ESC" key will return the display to the previous menu without affecting the menu from which "ESC" was entered. Use of the "RET" key will end the menu from which entered with any changes that were entered. a to use the Maintenance menu. Further, the operator is to use only the functions within the Operator and Archive menus that arq described in this Handbook.

6.4.1.1 Appending a Manually Recorded NOTAM to the Voice Message. From the basic screen (Figure 6.3) press "F1". This will result in a screen that looks like Figure 6.4. Select "F1" again €or the "Operator Menu", and enter the correct password when requested (Figure 6.5). The display will then change as shown in Figure 6.6. Select "F3" for the Voice Menu". The

display will then change as shown in Figure 6.7. Select "F1" (enter voice remarks) and the screen will change as shown in Figure 6.8. This display prompts to begin recording. As soon as the "F1" key is pressed, the display will change as shown in Figure 6.9 and the operator may begin recording using the microphone. The word "NOTAM" is used to preface the message. Example: "NOTAM...MEN AND EQUIPMENT WORKING ADJACENT RUNWAY ZERO FOUR TWO TWO UNTIL FURTHER NOTICE"

The countdown timer reflects the number of seconds of recording time remaining. To pause, press the "F2" key. To resume, press the "F2" key again. When the message is complete, press the "F1" key. When the "F1" key is pressed or the timer reaches zero, the display will change as shown in Figure 6.10. This menu allows for reviewing the message before transmission. Selecting "F2" (review) will change the screen as shown in Figure 6.11, and then Figure 6.12. After accepting the message, the display will return to the "Operator Menu" screen (Figure 6.6) and the NOTAM will be appended to the voice message. Once a NOTAM is appended to the automated voice message, the NOTAM will be included on subsequent one-minute updates of the automated voice message. It is essential, therefore, that the NOTAM information be kept current.

6.4.1.2 Revalidating a Manually Recorded NOTAM. From the "Voice Menu" (Figure 6.7), the selection of "F3", changes the screen as shown in Figure 6.13. The NOTAX message will end at 55 minutes past the hour unless revalidated between 45 and 54 minutes past the hour. To revalidate press "F1".

6.4.1.3 Cancelling a Manually Recorded NOTAM. From the screen shown in Figure 6.13, select "F2" (Cancel Voice Remark).

6.4.1.4 Changing a Manually Recorded NOTAM. The NOTAM is changed by recording a new NOTAX (paragraph 6.4.1.1, above). This new NOTAM will replace the previously recorded NOTAM.

6.5 Mode 3, Full-time Automated Operation with Manual Weather Augmentation and Airport NOTAM Option, Procedures. The procedures applicable to this mode of operation are the same as those for Mode 2, except for those necessary for a weather observer to append manual weather entries to the voice and Service A messages. Manual weather augmentation entries are to be recorded on MF 1-10 (or 1-10C) using Columns 2 (Time), 13 (Remarks) and 15 (Observer Initials) in accordance with paragraph 6.5.4, below. The manual entries to be appended are:

(a) Thunderstorms occurring at the point of observation, i.e., (1 thunder is heard, or (2) overhead lightning or hail is

observed, and the local noise level is such as might prevent hearing thunder at the point of observation.

(b) Precipitation (all forms, type and intensity) occurring at the point of observation.

(c) Obstructions to vision (alone or in combination with precipitation) at the point of observation when the AWOS visibility is 3 miles or less.

(d) Convective clouds (CB, CBMAM) within a five mile radius of the airport.

(e) Operationally significant, localized weather conditions (those not reported under (a)-(d), above, but that are operationally significant for airport operations) as follows:

- Blowing Sand
- Blowing Dust
- Blowing Snow
- Dense Smoke
- Patchy Fog or Fog Bank
- Heavy Precipitation (other than (b), above)
- Virga
- Tornadoes"'
- waterspouts"'
- Funnel clouds(1)
- volcanic eruptions(1)

Note:

Only those episodes of weather phenomena listed under paragraph (e), above, that are occurring within a five mile radius of the airport, and that pose an operational hazard for aircraft in the airport area should be reported. Weather phenomena marked with a (1) will be reported as urgent specials (USPs) using Mode 4 described in paragraph 6.6, below.

6.5.1 Observer/System Interaction. Observer interaction with the system is via the OT keyboard. The OT has three basic operation menus. They are: Operator, Maintenance, and Archive. The Operator menu allows interactive system control while continuing to display the measured weather parameters. Use of either the Maintenance or Archive menu will clear the measured weather parameters from the screen while in that menu. While operating within a menu, and unless keystrokes are made within 45 seconds, a keyboard timeout feature will return the screen to the previous screen displayed. Use of the "ESC" key will return the display to the previous menu without affecting the menu from which "ESC" was entered. Use of the "RET" key will end the menu from which entered with any changes that were entered. Note: The observer is not authorized to use the Maintenance menu. Further, the observer is to use only the functions within the Operator and Archive menus that are described in this Handbook.

6.5.2 Appending a Manual Weather Entry to the Service A Weather Message. From the basic screen (Figure 6.3) press "F1". This will result in a screen that looks like Figure 6.4. Select "F1" again for the "Operator Menu", and enter the correct password when requested (Figure 6.5). The screen will change as shown in Figure 6.6. Select "F1" for the "Operator Data Menu". The display will change as shown in Figure 6.14. Select "F1" (enter weather remark) and the screen will change as shown in Figure 6.15. Type in the information (maximum of 80 characters, including spaces), which is to include the type of entries listed under paragraph 6.5, above. The procedures in Federal Meteorological Handbook No. 1 (FMH-1) or, as applicable, Federal Meteorological Handbook No. 9 (FMH-9) apply to the formatting of these entries, except beginning/ending times are not required. Also, Column 5 (Weather and Obstructions to Vision) MF 1-10 (10C) entries, when reported, are to be the first augmentation and separated from any other augmentation entries by a space. This positioning of the Weather and Obstructions to Vision augmentation entries is essential for automated decoding of the AWOS observations. Preface the entry with the phrase "WEA:" to distinguish these manual entries from the preceding automated data. The required manual weather entries and examples of automated observations with appended manual entries are shown in Tables 6.3 and 6.4. Once a manual entry is entered into the system for appending to the Service A teletype message, the appended entry will be included on subsequent transmissions to the WMSC. It is essential, therefore, that these appended entries be kept current and representative of currently existing conditions. Note: Manual entries are displayed on the screen but are currently not included on the printer output. A planned system modification will make these manual entries available on the printer output.

TABLE 6.3

MANUAL WEATHER ENTRIES TO BE APPENDED TO AWOS OBSERVATIONS

Precipitation type:

Type	Contraction
Rain	R
Rain Showers	RW
Drizzle	L
Freezing Rain	ZR
Freezing Drizzle	ZL
Ice Pellets	IP
Ice Pellet Showers	IPW
snow	S
Snow Showers	SW
Snow Pellets	SP
Snow Grains	SG
Ice Crystals	IC
Hail	A

Precipitation intensity: **Light*is indicated by a minus "-" following the contraction. "Heavy" is indicated by a plus "+". "Moderate**is indicated by the absence of an intensity sign. No intensity is assigned to hail (A) or ice crystals (IC)

Thunderstorms:

Type	contraction
Thunderstorm	T
Severe Thunderstorm	T+

Obstructions to vision:

Type	Contraction
Volcanic Ash	Volcanic Ash
Fog	F
Ground Fog	GF
Blowing Snow	BS
Blowing Sand	BN
Blowing Dust	BD
Ice Fog	IF
Haze	H
Smoke	K
Dust	D
Blowing Spray	BY

e

TABLE 6.4

EXAMPLES OF MANUAL WEATHER ENTRIES APPENDED TO AWOS AUTOMATED OBSERVATIONS

Example of an automated observation with no automated remarks, a precipitation accumulation report (i.e., "P002", see note below), and an observer appended manual remark of light snow:

FOD SA 2055 AWOS M28 OVC 1 1/2 25/19/0315/946/ P002/WEA: S-

Example of an automated observation with an automated variable wind direction remark, a precipitation accumulation report (i.e. "P110", see note below), and an observer appended manual remark of thunderstorm and heavy rain shower:

€OD SA 0055 AWOS M5 OVC 1/2 70/68/3325G30/992/ P110/WND 30V36/ WEA: TRW+ T OVHD

Example of an automated observation with automated variable visibility and wind direction remarks, a precipitation accumulation report (i.e., "P005", see note below), and an observer appended manual remark of light rain, light freezing rain, light snow, and fog:

€OD SA 2255 AWOS M5 BKN 10 OVC 3/4 32/30/0412/980/ P005/VSBY 3/4V1 1/2 WND 02V08/WEA: R-ZR-S-F

Example of an automated observation with an observer appended manual remark of fog:

FOD SA 2155 AWOS -X 3/4 55/54/0904/999/WEA: F

Example of an automated observation with an observer appended manual remark of light rain shower and a convective cloud remark:

€OD SA 2255 AWOS M30 BKN 7 85/65/1815/992/WEA: RW- CB W

Example of an automated observation with an observer appended operationally significant remark of heavy precipitation (not at the point of observation):

FOD SA 2255 AWOS M35 BKN 10 85/70/2115/990/WEA: RW+ NW-N

TABLE 6.4 (Continued)

Example of an automated observation with an observer appended operationally significant remark of blowing dust:

FOD SA 2255 AWOS 50 SCT 7 80/45/2120G35/991/WEA: BD NW-NE

Note: Precipitation accumulation is the cumulative amount of liquid or liquid equivalent precipitation. The accumulation process starts and ends each hour with the hourly observation (i.e., 0055, 0155, 0255...etc). When detected, precipitation accumulation is reported on each observation transmitted over the Service A network. Thus, the accumulation reported on the hourly observation is the cumulative amount over the past hour. The accumulation reported between hourly observations is the cumulative amount since the accumulation process began at the time of the hourly observation. Precipitation accumulation is reported to the nearest 0.01 inch in inches/tenths/hundredths, and prefixed with the letter "P", e.g., "P110" represents 1.10 inches. The absence of a precipitation accumulation report indicates no precipitation accumulation. "Missing" precipitation accumulation is reported as "PMMM".

6.5.2.1 Revalidating a Manual Weather Entry. From the "Operator Data Menu" (Figure 6.14), the selection of "F2" changes the screen as shown in Figure 6.15A. Select "F2" to revalidate the entry. The manual entry will end at 55 minutes past the hour unless revalidated between 45 and 54 past the hour.

6.5.2.2 Cancelling a Manual Weather Entry. From the "Enter Weather Remark Screen (Figure 6.15) strike the "return/enter" (RET) key. This "null" entry will cancel any existing manual entry.

6.5.2.3 Changing a Manual Weather Entry. The entry is changed by using the OT keyboard to enter a complete, new entry (paragraph 6.5.2, above). This new entry overrides any existing entry.

6.5.3 Appending a Manually Recorded Weather Entry to the Voice Messaae. This procedure is used to include the same entries appended to the Service A teletype message (paragraph 6.5.2, above) in the AWOS voice broadcast. The voice and Service A manual entries must be the same. If one is revalidated/cancelled/changed, the other must also be revalidated/cancelled/changed. The maximum length of the recorded entry is 30 seconds. The OT keyboard strokes are the same as those for appending a NOTAM, and reference is made to the same figures. From the basic screen (Figure 6.3) press "F1". This will result in a screen that looks like Figure 6.4. Select "F1" again for the "Operator Menu", and enter the correct password when requested (Figure 6.5). The display will then change as shown in Figure 6.6. Select "F3" for the "Voice Menu". The display will then change as shown in Figure 6.7. Select "F1"(enter voice remark) and the screen will change as shown in Figure 6.8. This display prompts to begin recording. As soon as the "F1" key is pressed, the display will change as shown in Figure 6.9 and the observer may begin recording using the microphone. Manual voice entries are to be prefaced with the words "REMARKS...WEATHER" to distinguish these manual entries from automated voice remarks of density altitude, variable visibility, and variable wind direction generated by the system. EXAMPLE: "...[automated]...DENSITY ALTITUDE TWO THOUSAND...WIND DIRECTION VARIABLE BETWEEN THREE THREE ZERO AND ZERO FOUR ZERO...[manual]..."REMARKS...WEATHER...SEVERE THUNDERSTORM...HEAVY RAIN SHOWERS...HAIL...THUNDERSTORM OVERHEAD" The countdown timer reflects the number of seconds of recording time remaining. To pause, press the "F2" key. To resume, press the "F2" key again. When the message is complete, press the "F1 key. When the "F1" key is pressed or the timer reaches zero, the display will change as shown in Figure 6.10. This menu allows for reviewing the message before transmission. Selecting "F2"

(review) will change the screen as shown in Figure 6.11, and then Figure 6.12. After accepting the message, the display will return to the "Operator Menu" screen (Figure 6.6) and the manual voice entry will be appended to the voice message. Once a manual voice entry is appended to the automated voice message, the entry will be included on subsequent one-minute updates of the automated voice message. It is essential, therefore, that the manual voice entry information be kept current.

6.5.3.1 Revalidating a Manually Recorded Voice Weather Entry. From the "Voice Menu" (Figure 6.7), the selection of "F3", changes the screen as shown in Figure 6.13. The manually recorded voice message will end at 55 minutes past the hour unless revalidated between 45 and 54 minutes. To revalidate press "F1".

6.5.3.2 Cancelling a Manually Recorded Voice Weather Entry. From the screen shown in Figure 6.13, select "F2" (Cancel Voice Remark).

6.5.3.3 Changing a Manually Recorded Voice Weather Entry. The voice entry is changed by recording a new entry (paragraph 6.5.3, above). There is no need to cancel the previous manual voice entry before recording a new entry.

6.5.4 Entries on MF 1-10 or MF 1=10C. All manual weather augmentation entries to include revalidations, cancellations, and changes are to be recorded on MF 1-10 (or 1-10C). Examples of these entries are shown in Table 6.5. •

6.5.5 Setting a Channel (Sensor) In/Out of Service. If a channel (sensor) fails (i.e., parameter data are missing, garbled or unquestionably erroneous) while the system is being operated in Mode 3 and being augmented by a weather observer, the failed channel is to be set out of service. To set a channel (sensor) in/out of service, select "F2" from the "Operator Menu" (Figure 6.6). The screen will change as shown in Figure 6.16 (Failure Override Menu). Select "F1" "Channel In/Out", the screen Will change as shown in Figure 6.17. Select the appropriate "F" key to toggle the "in" or "out" status of a channel. If the channel (sensor) that fails is one of the critical parameters (i.e., ceiling/sky condition, visibility, wind direction/speed, or altimeter setting) and backup is required, the system is to be changed to manual mode (paragraph 6.6, below) and manual backup implemented, Once the problem is corrected, the channel (sensor) is to be set "in" service, manual backup discontinued, and the system returned to automated operation with augmentation (Mode 3). The procedures for return to automated operation are specified in paragraph 6.6.4, below. NOTE: Putting a channel

TABLE 6.5

EXAMPLES OF MANUAL AUGMENTATION ENTRIES ON MF 1-10 (or 1-10C)

Col 2 (Time)	Col 13 (Remarks)	Col 15 (Initials)
	(S- and F entry at 1550)	
1550	WEA: S-F	KK
	(Revalidation of 1550 entry at 1650)	
1650	WEA: S-F	CH
	(Change at 1715 adding R-)	
1715	WEA: *R-S-F*	FG
	(Change at 1750 ending S- and F)	
1750	WEA: R-	LM
	(Cancellation at 1830 ending R-)	
1830	WEA: NONE	SI

(Note: The entry of "NONE" is used only to record ending of augmentation entries. It is not voiced or appended to the Service *A* message)

(sensor) out of service Will cause the data for that sensor to be shown as "missing" on the screen.

6.6 Mode 4. Part-time Manual Operation. Procedures. Operation in the manual mode permits a weather observer to enter a complete manual weather observation into the system. Operation in the manual mode does not cancel the automated observations, which will continue to be generated and displayed. This allows the observer to selectively use the automated data in the composition of a manual observation. Operation in the manual mode stops the transmission of the automated observations to the WMSC for dissemination over Service A and replaces them with the manual observations. It also stops dissemination of the automated observations to the ground-air and telephone voice outlets. Therefore, the manual observations must be manually recorded by the observer for dissemination over the ground-air radio and telephone voice outlets. Note: The automated wind direction output is with respect to magnetic north. If used in the manual observation entered into the system for transmission to the WMSC, it most be converted to true north. However, the wind direction manually recorded by the observer for dissemination over the ground-air and telephone voice outlets is with respect to magnetic north.

6.6.1 Observer/System Interaction. Observer interaction with the system is via the OT keyboard. The OT has three basic operation menus. They are: Operator, Maintenance, and Archive. The Operator menu allows interactive system control while continuing to display the measured weather parameters. Use of either the Maintenance or Archive menu will clear the measured weather parameters from the screen while in that menu. While operating within a menu, and unless keystrokes are made within 45 seconds, a keyboard timeout feature will return the screen to the previous screen displayed. Use of the "ESC" key will return the display to the previous menu without affecting the menu from which "ESC" was entered. Use of the "RET" key will end the menu from which entered with any changes that were entered. Note: The observer is not authorized to use the Maintenance menu. Further, the observer is to use only the functions within the Operator and Archive menus that are described in this Handbook.

6.6.2 Set Manual Mode. From the basic screen (Figure 6.3) select "F1". This will result in a screen that looks like Figure 6.4. Select "F1" again for the "Operator Menu" and enter the correct password when requested (Figure 6.5). The display will then change as shown in Figure 6.6. Select "F5" for "System Mode". The display will then change as shown in Figure 6.18. Select "F1" to put the system in the manual mode, which will be